BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: April 18, 1997

TO: E. Lessard

FROM: G. Schroeder

SUBJECT: V Target NESHAPs Evaluation

Based on your previous memo and our conversation of April 17, the following facts regarding the g-2 V target cave have been established:

1. Chlorine isotopes -39 ($t_{½}$ = 55 min.), -38 ($t_{½}$ = 37 min.), and -34 ($t_{½}$ =1.5 sec.) will be generated in the target with equilibrium activities of 470, 230, and 170 mCi, respectively.
2. Based on previous AGS experience with platinum targets, some gaseous chlorine release from the target is expected, though the exact release fraction is not known.
3. The target is sealed in a stainless steel confinement box. The air exchange rate for the box will cause an off-gas hold up time of about 15 minutes, allowing for some radioactive decay of any chlorine released from the target.
4. Air from the confinement box will be passed through polyester, HEPA, and charcoal filters. High efficiency adsorption of the chlorine by the charcoal filter is expected. Decay of adsorbed radionuclides will take place at that point.
5. Any chlorine atoms which escape the filter will decay inside the inner cave area, which is sealed off from the outer cave.
6. There will be no mechanical ventilation in the target cave during the irradiation period.

Radioactive chlorine gas will be retained in the V target station by the following barriers: (1) the metal matrix of the target, (2) a charcoal filter, (3) the inner target cave, and (4) the outer cave, which is itself sealed from the outside by a vestibule containing two sequential entry doors. Hold up decay will occur in the target confinement box, in the filter unit, and in the target cave. Based on the short half-lives of the radionuclides to be produced, the atmospheric barriers in place, and the lack of ventilation, no release of radioactive chlorine to the atmosphere is anticipated. As stated in your previous memos of 3/6/91 and 5/8/96, no intentional venting of the target area prior to a minimum 24 hour decay period is planned. Therefore, no further evaluation of this facility with respect to NESHAPs is required.

Please note that the original NESHAPs review that was performed in January 1992 included air activation products expected to be produced in the target area by a section of the beam not enclosed in a vacuum. That review very conservatively assumed some degree of ventilation in the building. Even so, no additional action was required due to the extremely small projected off-site doses. That review in conjunction with this analysis of the radioactive products induced in the target will serve together as the NESHAPs compliance documents for the V target.

As a confirmatory measure, you proposed the collection of air samples outside of the V target cave doors to ensure that no unanticipated releases are occurring. I strongly support this and urge you to carry out such measurements. I would like to receive a copy of any analytical data generated by this sampling.

GS/rt

cc: J. Granzen, DOE
H. Kahnhauser
R. Lee
D. Lowenstein
O. White
EC5220.97

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: January 9, 1992

TO: E. Lessard

FROM: G. Schroeder

SUBJECT: G-2 Experiment NESHAPs Evaluation

As required by 40 CFR 61 Subpart H (NESHAPs), an evaluation of the G-2 experiment with respect to airborne radioactivity has been performed. The dosimetric impact to the closest off-site resident is approximately 4E-4 mrem/yr. This dose is below the administrative level (1E-4 rem/yr) for formal submission to EPA for a NESHAPs permit to carry out this operation. A copy of the evaluation is attached and should be maintained in your records as a compliance document.

BLC\EC3032.92
Attachment: G-2 Experiment NESHAPs Evaluation

cc: W. Casey, w/o attachment
R. Miltenberger, w/attachment
J. Naidu, w/o attachment
C. Polanish, DOE w/attachment
Environmental Assessment File

REQUEST FOR APPROVAL TO CONSTRUCT OR MODIFY SOURCES OF ATMOSPHERIC EMISSIONS OF RADIONUCLIDES

Prepared by
G. Schroeder
January 9, 1992

I. NAME AND ADDRESS OF APPLICANT

U. S. Department of Energy
Acting Area Manager: Mr. David Goodwin
50 Bell Avenue
Building 464
Upton, New York 11973

II. NAME AND LOCATION OF SOURCE

Name: G-2 Experiment, "V" Target Station
Location: Brookhaven National Laboratory
Upton, New York 11973

Latitude: N 40° 52'
Longitude: W 72° 53'

DESCRIPTION:

The buildings associated with the "G-2" experiment are located on the reservation of Brookhaven National Laboratory. Brookhaven National Laboratory is a multidisciplinary scientific research center located close to the geographic center of Suffolk County on Long Island, about 97 km east of New York City. Its location with respect to surrounding communities is shown in Figure 1. About 1.4 million persons reside in Suffolk County and approximately 0.41 million persons reside in Brookhaven Township, the municipality within which the Laboratory is situated. The distribution of residential population within 80 km of the BNL site is also shown in Figure 1.

The site map in Figure 2 shows general features of the BNL facility. The "V" Target Station is located near the Alternating Gradient Synchrotron facility. Nearby residences along with an approximate location of the planned "V" Target Station are indicated in Figure 3. A topographic map of the BNL reservation has been previously provided as part of the 40 CFR 61.07 Application for Permit to Modify BNL Building 705.

III. RELEASE POINT INFORMATION

Emission Point ID:	G2-AGS
Stack height (ft.):	N/A
Exit velocity (ft./sec):	N/A
Exhaust temp. (° F):	ambient

IV. TECHNICAL INFORMATION ABOUT THE SOURCE

A. Overview of Operations

The "G-2" experiment will utilize beam from the Alternating Gradient Synchrotron (AGS). Before the extracted beam reaches the main G-2 experimental area, it will first undergo a path change at the area called the "V" Target station. It is at this unmanned target station that the beam will travel through air and have the potential to produce air activation products.

B. Ventilation System Description

Since the "V" Target Station is to be an unmanned facility, no ventilation system will be in place. There is, however, the potential for unforced ventilation to occur via internal and external pressure differences and cracks in the structure, i.e., between concrete blocks, any doorways that may exist, etc. Volumetric air change rate is estimated to be one per hour.

Since there are no exhaust stacks involved, the release of radionuclides has been assumed to occur about five meters above ground level. This produces a more conservative estimate of resulting doses than assuming a ground level release.

C. Source Term Development

The source term generated by the operation of the G-2 experiment results from the experimental beam passing through air where activation may occur. The source term estimates have been generated by the CASIM Monte Carlo computer code. The predicted nuclide quantities are based on the totals that would be present at the end of a four week running period of the G-2 experiment. Note that no ventilation is assumed during the running period and that the source term is treated as though it is released as a single "slug" at the end of the run. This assumption will again favor a conservative dose estimate.

The predicted nuclide activities are as follows:

Nuclide	Ci produced
Ar-41	0.04
S-35	0.0004
P-32	0.002
Al-28	0.001
Na-22	0.00001
O-14	0.2
N-13	0.2
C-11	0.2
Be-7	0.05
H-3	0.002

D. Dose Assessment

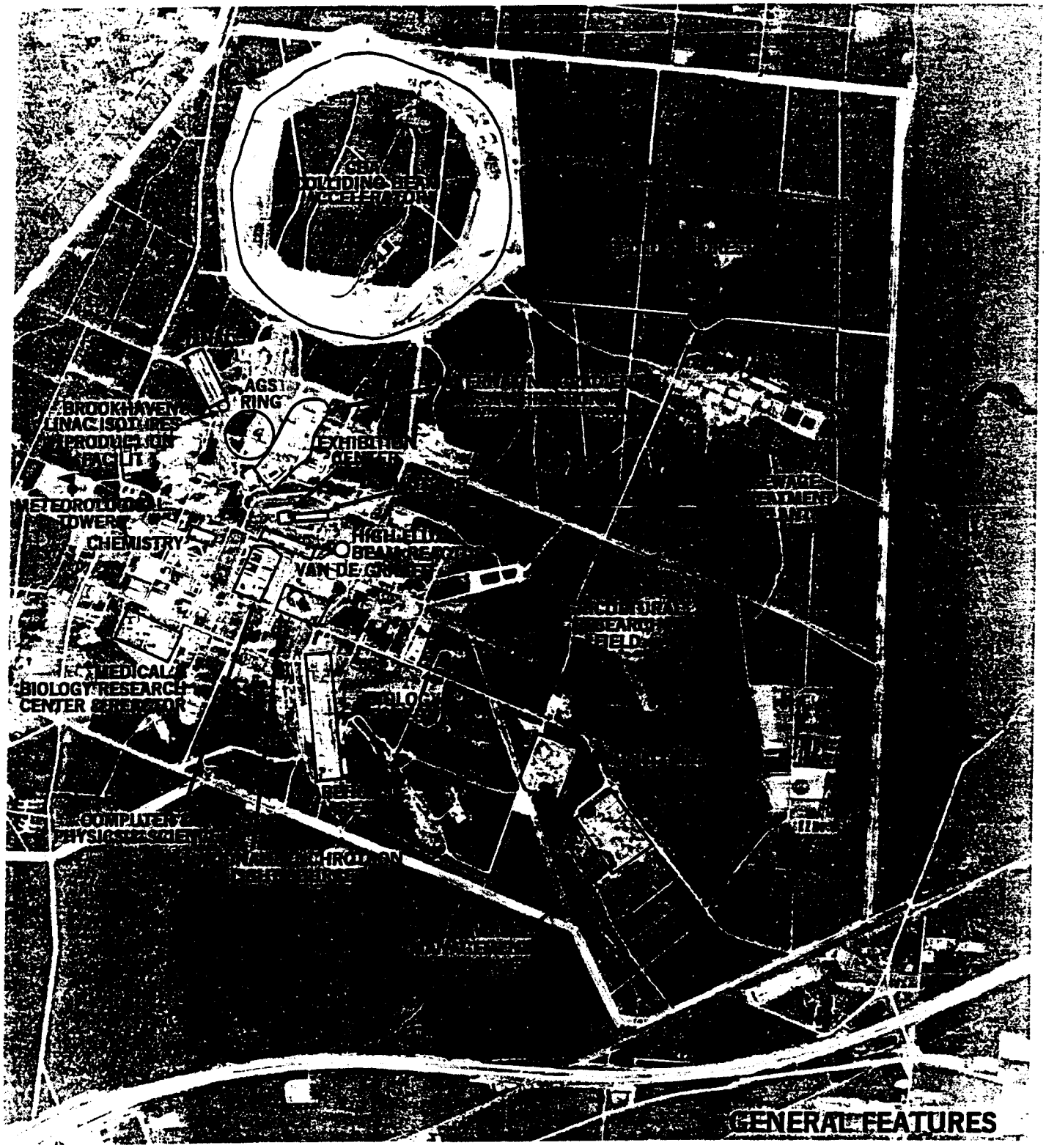
The radiological impacts to the off-site public have been estimated with the CAP-88 modeling code. A site-specific model was utilized with 10 year average meteorology information (wind rose, temperature, and precipitation). In cases where the CAP88 model did not contain the necessary nuclides in its library, analogues of similar radiological and chemical nature were substituted. The calculated dose resulting from these analogues were then corrected by multiplying the dose by the ratio of the desired nuclide's dose conversion factor and the analogue's conversion factor.

The facility specific impact to the maximally exposed individual at a distance of 1.55 km from the emission point are presented in Table 1. The collective doses are also shown in Table 1.

For the source terms discussed in Section IV.C, the maximum individual's whole body dose is 4.05E-4 mrem per year. The collective dose from the operation of this source would be 3.08E-3 person-rem per year. The site boundary maximum individual total body dose is smaller than the 0.1 mrem per year dose that triggers the formal permitting process by EPA (December 15, 1989 Federal Register).

TABLE 1

NUCLIDE	RELEASE (Ci/yr)	MAXIMUM INDIVIDUAL WHOLE BODY DOSE (mrem/yr)	COLLECTIVE POPULATION DOSE (person-rem/yr)
Ar-41	0.04	4.09E-5	1.43E-4
S-35	0.0004	1.23E-7	6.12E-7
P-32	0.002	1.22E-5	5.87E-5
Al-28	0.001	4.02E-13	5.91E-15
Na-22	0.00001	3.23E-5	3.29E-4
O-14	0.2	7.55E-7	1.30E-8
N-13	0.2	1.70E-5	4.79E-6
C-11	0.2	4.60E-5	1.92E-5
Be-7	0.05	2.55E-4	2.51E-3
H-3	0.002	4.18E-7	1.13E-5
Total		4.05E-4	3.08E-3



OVERLAY FOR BASE 3, BROOKHAVEN

0 100 METERS 400 500 600 700

0 500 FEET 1500 2000

BASE 3

BROOKHAVEN
NATIONAL LABORATORY

40 52 15 N 72 52 45 W
(LABORATORY LOCATION)
PHOTO DATED APRIL 1980

PREPARED IN 1983
PREPARED IN 1981
FOR DOE
BY EG&G

BASE 3 GENERAL FEATURES

FIGURE 1

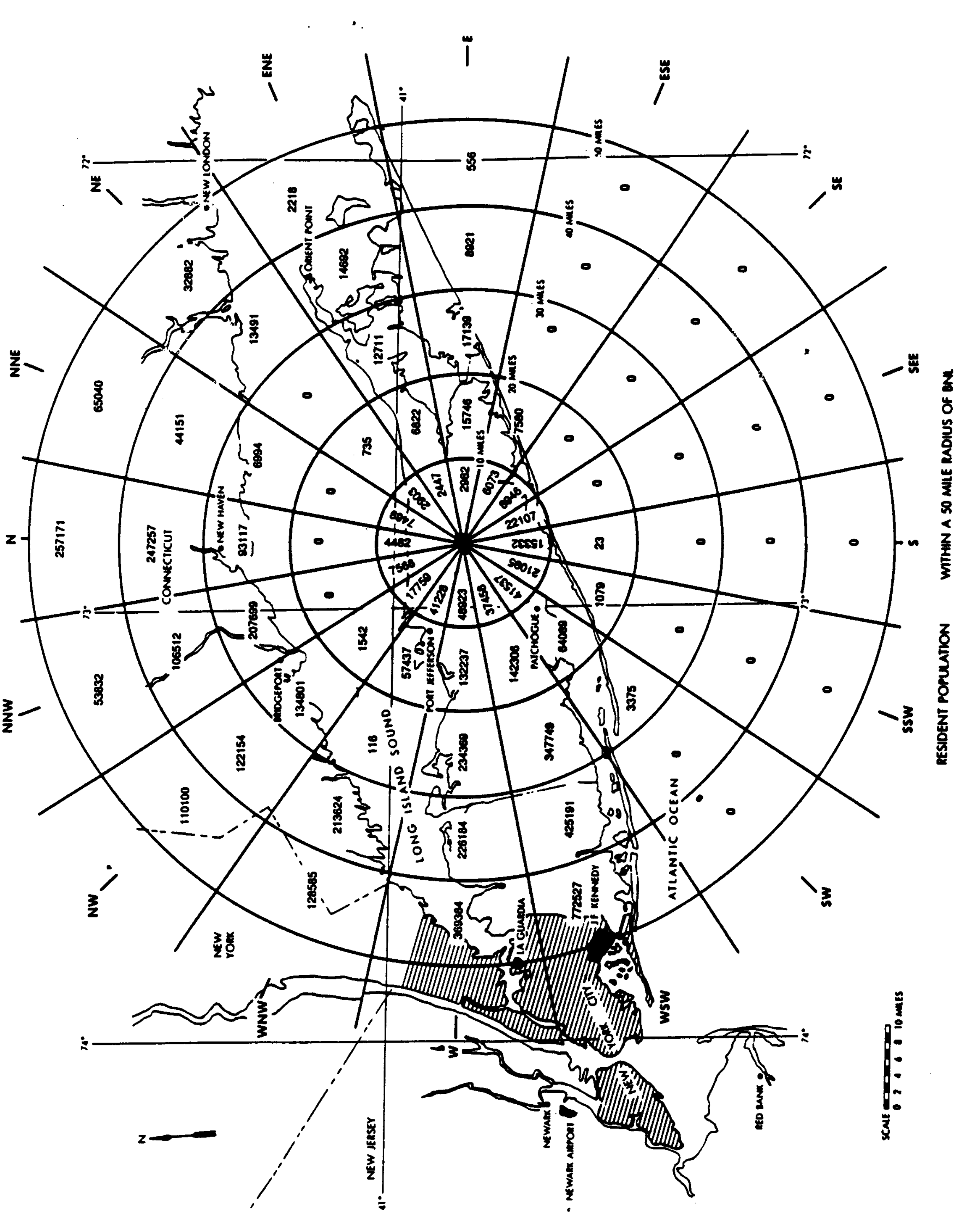
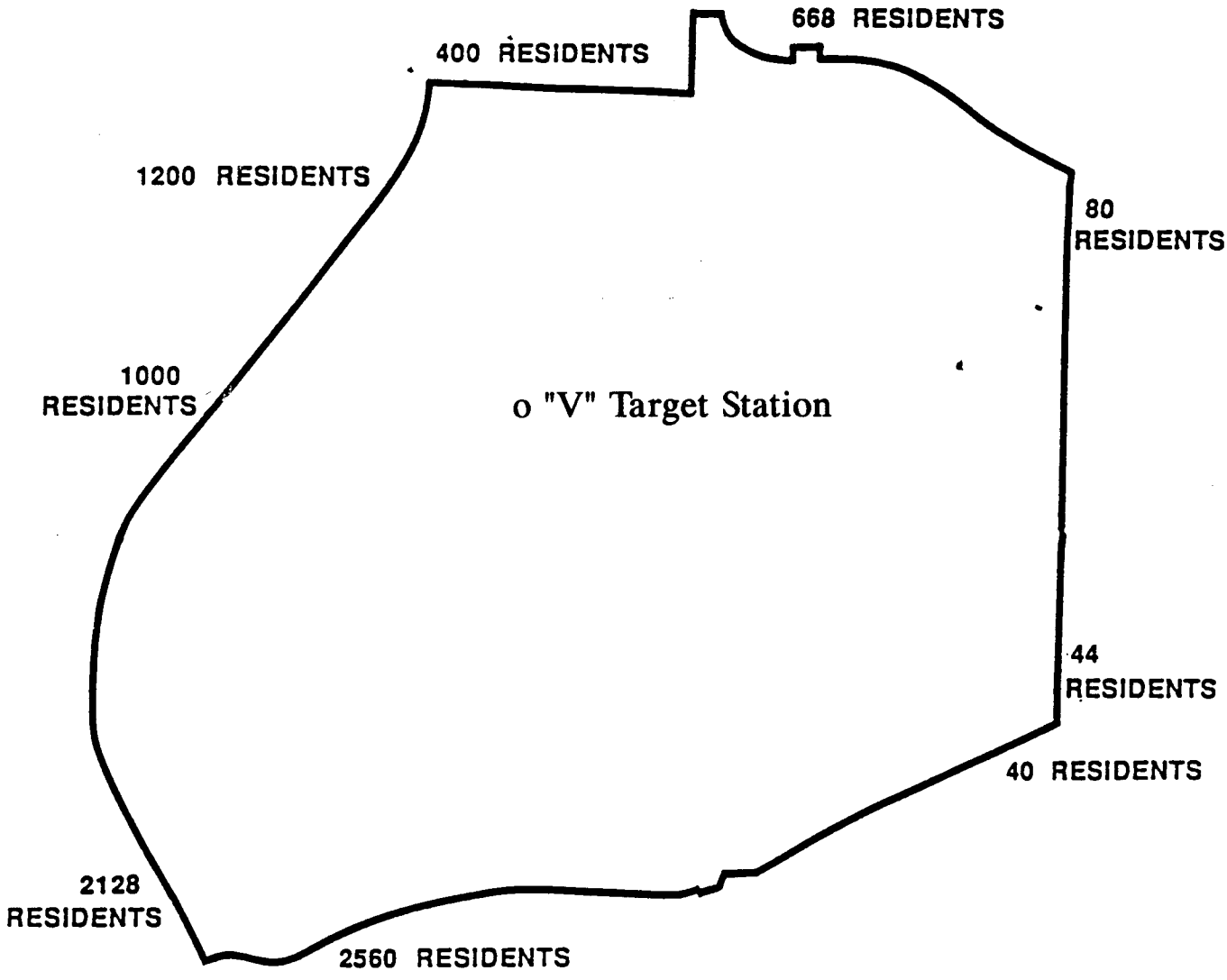

RESIDENT POPULATION WITHIN A 50 MILE RADIUS OF BNL
N
NNE
NE
ENE
E
ESE
SE
SEE
S
SSW
SW
WSW
W
WNW
NW
NNW
10 MILES
20 MILES
30 MILES
40 MILES
50 MILES
CONNECTICUT
NEW HAVEN
NEW LONDON
BRIDGEPORT
ORIENT POINT
PORT JEFFERSON
PATCHOGUE
LONG ISLAND SOUND
ATLANTIC OCEAN
LA GUARDIA
J F KENNEDY
NEW YORK CITY
NEW YORK
NEW JERSEY
NEWARK
NEWARK AIRPORT
RED BANK
SCALE 0 2 4 6 8 10 MILES
72°
73°
74°
41°

FIGURE 2



BROOKHAVEN NATIONAL LABORATORY
LOCAL POPULATION DISTRIBUTION

SCALE

0 360 METERS

FIGURE 3